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HOW TO
KEEP AND
INCREASE
BLACK
GRAMMA
ON SOUTHWESTERN
RANGES



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HOW TO KEEP AND INCREASE BLACK GRAMA ON SOUTHWESTERN RANGES

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Black grama (*Bouteloua eriopoda*), also known locally as woolly-foot or crowfoot grama, is by far the most important forage grass on the 89 million acres of semidesert grasslands in Arizona, New Mexico, southwestern Texas, and southern Utah. Although not as common now as in the early days, black grama can be maintained on the range and even brought back by management based on careful consideration of its forage and soil-protection values, its methods of spreading, and its ability to stand up under drought and grazing.

As a prime indicator of range utilization, black grama ranks second only to blue grama (*Bouteloua gracilis*) over the entire Southwest. The two sometimes occur together in mixed stands, but blue grama typically grows in piñon-juniper woodlands and on the heavier soils of the short-grass plains, whereas black grama is found on the better-drained soils in the short-grass country and the warmer and lower semidesert grasslands. Black grama may be easily distinguished from other gramas by its widely creeping runners or stolons, which root at the joints and send up new shoots that later become separate plants. (See cover illustration.)

Why Keep Black Grama on the Range?

Black grama has three important characteristics that make its retention on southwestern ranges essential—its wide occurrence, its forage value, and its usefulness as a soil protector.

This grass thrives throughout the Southwest and is also found in southern Utah, usually inhabiting dry mesas and hills at elevations of 3,500 to 5,500 feet above sea level, and growing equally well on compact sandy or gravelly soils. Although most abundant in the southern portions of its range, it is important as far north as the Verde Valley on the Prescott and Coconino National Forests in Arizona and the Cibola National Forest in New Mexico. On the 13 southwestern national forests it is one of a dozen foremost forage plants and is a primary indicator of range utilization on 8 of them—the Cibola, Coconino, Coronado, Crook, Gila, Lincoln, Prescott, and Tonto. Black grama range is in all types of ownership, and is therefore important not only to administrators of the public range but also to private stockmen.

The grass is highly relished and nutritious at all times of the year. Although fully 90 percent of the growth is produced during the summer rainy season (usually July, August, and September), it ordinarily cures well on the stalk, and the stems remain green several inches up from the ground. In nutritiousness it compares very favor-

¹ Maintained at Tucson, Ariz., in cooperation with the University of Arizona.

ably with other important range forage grasses, as shown in chemical analyses made by the New Mexico Agricultural Experiment Station; and, except under occasional conditions of extreme dryness, it retains its nutritive value through the dry spring period when most other range vegetation is parched and harsh. In an exceptionally wet spring, fresh weed growth may temporarily divert livestock from the cured black grama, and in early summer such grasses as three-awns (*Aristida* spp.) and dropseeds (*Sporobolus* spp.) may furnish some feed before the grama greens up, but year in and year out black grama is a dependable forage relished year long by livestock, especially cattle and horses (fig. 1). Under conservative grazing it is



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FIGURE 1.—Typical black grama range in good condition.

usually eaten somewhat more sparingly by sheep and goats. Where black and blue gramas occur together, the latter is usually preferred.

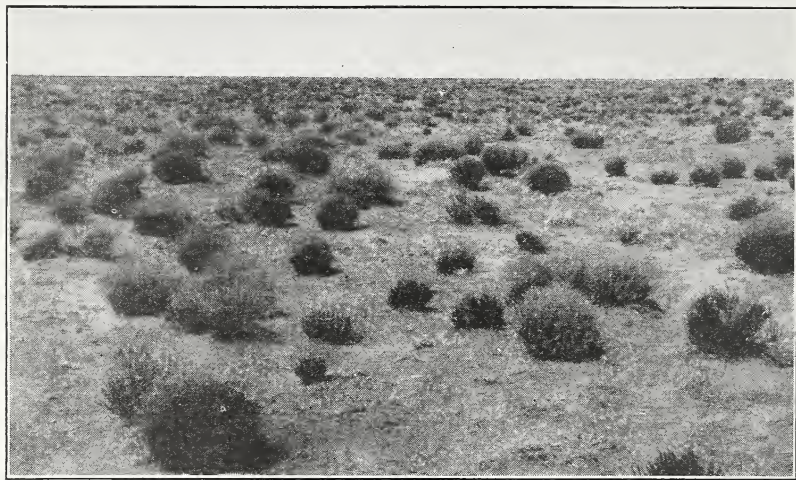
Because black grama is such good feed, it has been grazed to the point that today there are few pure stands left. It has often given way to poorer forage plants such as three-awns and certain dropseeds and on many ranges has nearly disappeared, leaving in its place only such low-value or worthless forage plants as snakeweed (*Gutierrezia sarothrae*) (fig. 2), cacti, yuccas, creosotebush (*Covillea tridentata*), and mesquites.

Although black grama grows under precipitation that supports hardly more than 0.3 to 0.4 of a complete plant cover, it will, if properly utilized, provide sufficient soil protection. Its dense tufts, and especially its runners rooting at the joints, hold soils well in place. Only when the tuft area is seriously reduced by severe grazing or drought or both does the plant fail to perform this soil-protective function. Once the topsoil movement is accelerated, it is very difficult to stop, because the soils continue either to be eroded away from the plant roots or to be deposited on top, thus weakening or killing the plants.

How Black Grama Spreads

The necessity for keeping the forage and soil-protection values of black grama on ranges that are in good condition and restoring these values on run-down ranges makes it important to understand how the grass spreads and reproduces.

Artificial reseeding and transplanting of black grama have been tested at several locations in the Southwest, both on the national forests and elsewhere. Seedlings were actually grown on the range from broadcast sowing in southern New Mexico, but seed production of



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FIGURE 2.—Deteriorated black grama range taken over by snakeweed.

black grama is usually so poor that this method is costly and uncertain at best. Transplanting sod was more successful, the survival from summer plantings being about 60 percent, but this method also is far too costly for practical use under ordinary range conditions. After several years of experimentation, natural revegetation remains the simplest and most practical method of maintaining and restoring black grama on the range.

Black grama spreads or reproduces naturally in three ways: (1) By means of seed, (2) by runners from the old plants, and (3) by tillering or the lateral spread of new stems arising from the outside edge of the tuft. Seed production is negligible, for, although flower stalks and flowers are usually abundant, few seeds are matured in most years. Germination may be as high as 94 percent ² but is usually under 15 percent, and only under unusually favorable conditions do black grama seedlings grow and survive.

Successful spreading by runners requires two successive favorable growing seasons, the first for the new plants to get started, and the second for them to become rooted and firmly established as individuals. A black grama tuft may produce from one to nine runners, but excessive trampling by livestock breaks off many of them before they become rooted. The main advantage of runners is that new plants become established at some distance from the parent plant, thus under

² This is the highest percentage obtained with specially cleaned seed in which the grains were removed from the florets.

moderate use spreading the stand more rapidly to ungrassed areas. This method is of greatest importance at the lower elevations where seedlings are scarcest.

Tillering and the breaking up of black grama tufts into new plants is generally the most effective means of revegetation. Spread during a given growing season depends chiefly on the vigor resulting from climatic conditions during the preceding year. In other words, the stockman can have the benefit of almost a year's advance notice of changes in amount of black grama, since above-average rainfall of one year produces an increased stand the following year, and contrariwise.

Proper Utilization

Because black grama reproduces most successfully by tillering and runners, proper utilization encourages these processes. Established plants can resist close recurrent grazing, but spread is unsatisfactory under heavy use.

Where black grama is dominant, it is a key indicator of general range utilization; that is, when black grama is properly grazed, the

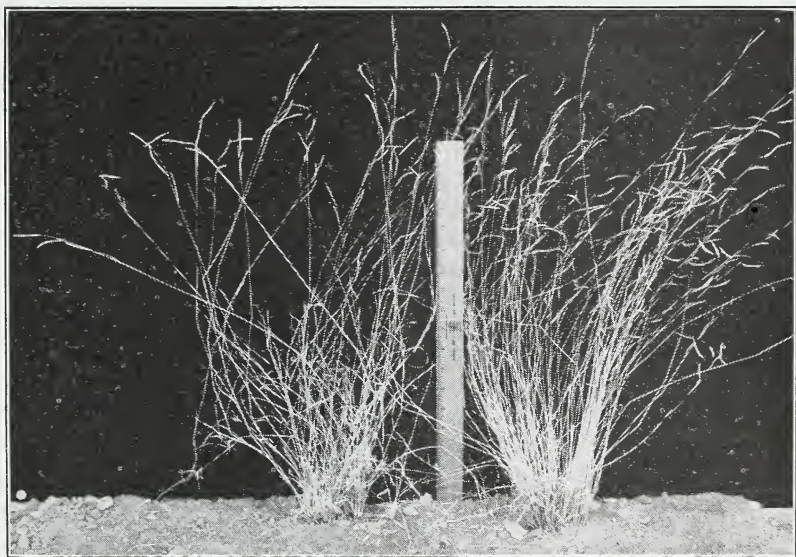


FIGURE 3.—Unused plants of black grama.

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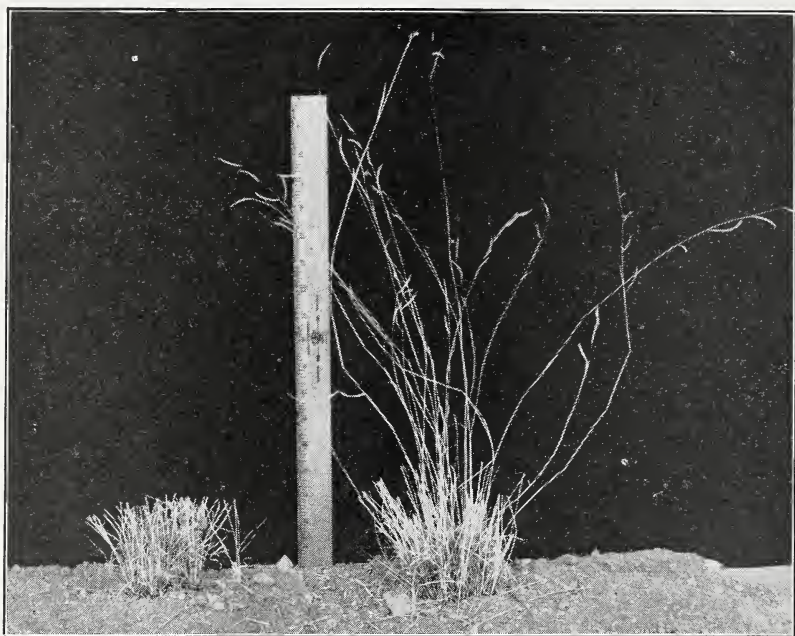
associated plants and the range as a whole may be considered properly grazed (fig. 3). Associated species may be grazed as much as possible provided the grama is not overused. Where black and blue gramas occur in mixture, utilization is satisfactory as soon as either one is properly grazed; usually the first to be so utilized is the blue grama.

Black grama's ability to withstand grazing has been determined by 23 years of actual grazing experiments, supplemented by clipping studies, on the Jornada experimental range in southern New Mexico, which is in the heart of the largest remaining black grama range in the United States, and on the Santa Rita experimental range, which borders the Coronado National Forest in southern Arizona.

Proper grazing utilizes about 50 percent of the total growth of black grama on a weight basis by the end of the grazing season, which

usually means that from 70 to 85 percent of the height growth is taken on most plants. On ranges in fair to good condition the grazed stubble should be cropped not closer than 2 or 3 inches above the ground by the end of the grazing season in June, under both year-long and seasonal winter use. In addition, one-fifth of the flower stalks and most of the runners should be ungrazed. Cattle actually graze in such fashion, cropping off certain plants and leaving others untouched, or partially grazed; thus, a few tufts are sometimes grazed to within 1 inch of the ground, and others are utilized to within only 4 or 5 inches (fig. 4). Consistent grazing to within 1 or 2 inches of the ground constitutes severe overutilization.

Proper use at any time prior to the end of the grazing season is roughly proportional to the length of the season remaining. Thus



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FIGURE 4.—Properly used plants of black grama. The tuft on the left is too closely used; the one on the right is underused; considered together, use is about proper.

if 50 percent of the grama should be taken on year-long ranges by the end of the growth year in June, only 25 percent should be taken by December or January, when the season is half over. This is equivalent to leaving about half the flower stalks and all the runners untouched, with the grazed portions of the tufts cropped not closer than 3 or 4 inches above the ground. By the end of the summer growth period, approximately one-fourth of the season has passed, and proper use at that time would take about 12 percent of the grass. Close range inspection is needed to detect so light a use.

On run-down black grama ranges, where three-awn, snakeweed, or creosotebush may now be the principal plants, proper grazing depends partly on the degree of use on black grama remnants and partly on the use of the present dominant vegetation. The aim

should be eventually to restore black grama to dominance, and this necessitates very conservative use. To make sure of its comeback, black grama should be grazed somewhat less on run-down range than on satisfactory range—possibly 35 percent of the grass should be taken by the end of the season instead of 50 percent. This would leave roughly one-third of the flower stalks and most of the runners untouched, and grazed portions cropped not closer than 3 or 4 inches above the ground. The less palatable associated species, such as the three-awns, may be grazed moderately, provided the spreading or revegetation of black grama is not retarded.

To preserve the natural soil-protective qualities of black grama, slopes in excess of about 50° should not be grazed. Forage on slopes steeper than about 42° probably should not be included in determining grazing capacity. The incidental use that occurs on such slopes should be regarded as a little extra "velvet" that may serve well toward a drought reserve.

Improper Utilization

Nonuse is fully as improper as overuse on black grama ranges in good condition, but on run-down ranges light use must be practiced for several years to allow the grama to recover vigor essential for restoration. A 13-year study on the Jornada experimental range indicates that forage production is, year in and year out, practically as good on properly used range as on ungrazed pastures, or better. Density of ground cover is about the same, average plant height is only slightly less, and recovery from drought may be more rapid on the properly used range. Moderate grazing promotes tillering and breaks up large individual plants into several smaller tufts better adapted to utilize available moisture. Under normal conditions ungrazed black grama grows into large bulky tufts that gradually stagnate, lose thriftiness, and decline in forage production; this has occurred on fenced range-study plots on the Tonto National Forest. Indications of underuse include the leaving of more than half of the total herbage and over one-fifth of the flower stalks of black grama on the ground at the end of the grazing season (fig. 4); an abundance of old growth and litter rotting on the ground; large stagnated, unthrifty, and partially dead grama tufts; and slight grazing of such "dessert" forage as the highly relished flower stalks of yuccas and sacahuista (*Nolina microcarpa*).

Continued overutilization results in a run-down range, indications of which include accelerated wind and water erosion, finger gullies, a pebble pavement, pedestaled tufts, and more plants of low grazing value, such as the three-awns, burro grass (*Scleropogon brevifolius*), some dropseeds, fluffgrass (*Triodia pulchella*), and snakeweed. Signs of current overuse relate largely to black grama since it is the key utilization indicator plant. The almost complete absence of flower stalks, uniform cropping closer than 2 inches above the ground, lack of spreading by runners, and grazing of more than half of the total herbage all mean overutilization of black grama. Plants are much overutilized when the color of the soil rather than the vegetation becomes dominant through the tuft, when the range has a sand-papered appearance, and when small surface rocks, cow chips, and other litter protrude noticeably above the grazed level of the plants.

Preferred Management Practices

Black grama is best suited to grazing by cattle and horses. Sheep thrive on the grass, however, in the short grass of eastern New Mexico and on certain national-forest driveways, and under conservative use do not appear to injure it.

Good black grama range in eastern and southern New Mexico will graze about 18 to 20 cows to the section the year through. On high-class mixed black grama and blue-grama ranges in northern Arizona grazing capacity may be as high as 25 head to the section year long. From this maximum, capacity drops along with progressive stages of range deterioration to where not more than four or five head to the section can be conservatively handled on a year-long basis.

When other areas are available for summer grazing, such as high forest land or tobosa (*Hilaria mutica*) and galleta (*H. jamesii*) types, it is preferable to defer use of the grama until after summer growth is complete. This encourages vegetative spread by tillering and runners, promotes summer use of other species that are relished only when green and succulent, and takes advantage of black grama's palatability during the winter and spring. Summer grazing should be eliminated particularly from important watersheds and run-down ranges where black grama formerly predominated. In addition to proper seasonal distribution, livestock should be drawn onto the areas of better feed by salting, and proper utilization should be maintained to within one-half to three-fourths of a mile from permanent water, but with no material overuse even in this zone.

Black grama is remarkably drought resistant, but on ungrazed range drought alone may reduce the grama stand 90 percent, and in the Southwest 2 to 4 years out of 10 are drought years in which precipitation is 75 percent of average or less. Management practices in which stocking fluctuates with this variable forage production, or is so consistently heavy that frequent supplemental feeding is required are not recommended. Two cardinal principles are (1) that utilization should in no year be closer than proper and (2) that herd size should be kept reasonably constant year in and year out. These aims may be attained by a long-time system of conservative grazing under which livestock numbers are so restricted that, even in the years when forage production goes below 75 percent of average, black grama will be utilized only to the point here defined as proper use. The excess feed left in better years will help to tide over the herd in years when forage production is below 75 percent of normal and only in the occasional very severe drought would substantial herd reductions or material supplemental feeding be necessary to prevent overutilization of the range or starvation losses of livestock.

Management practices are the means whereby proper utilization is attained and utilization guides serve to check on the adequacy of existing management. A higher return on the investment resulting from higher calf crops and heavier calves, reduced starvation losses, and less supplemental feed is being enjoyed by those outfits wherein the management and utilization are designed to maintain black grama and restore it on the range.

